Estimating Health Related Economic Loss in Norwegian Salmon Production

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Abstract

A model for estimating health related economic loss in sea farmed Atlantic salmon in Norway is presented. The model is making use of data from official and production databases for rough estimation of economic losses. Presented losses are to various degrees related to health. In total, the economic losses for farmed Atlantic salmon in Norway in 2004 were estimated to € 246 millions.

Introduction

A four year research project (SVINN) at Norwegian School of Veterinary Science, Oslo, is established in order to study health related losses in farmed Atlantic salmon with regard to magnitude, risk factors and economic impact.

Methods for estimating costs of disease has been developed within traditional farming in order to support decisions concerning disease control and research priorities (Bennett & Ijpelaar 2005). In farmed Atlantic salmon, similar knowledge are scarce and do only exist for a few diseases. For example, an annual direct cost of cataract in salmon was estimated to cost Norwegian fish farmers € 28 mill annually, reaching € 55 mill in years of high incidence (Menzies et al. 2002). The direct annual financial loss of cardiomyopathy syndrome (CMS) has been estimated to € 4,5 to 8,8 mill (Brun et al. 2003). In both studies, only the direct economic effect of disease was estimated while the cost of non-veterinary expenditures, treatment and prevention was assumed to be null. An alternative way of estimating economic losses in Atlantic salmon farming is presented in this paper.

Objective

The objective of this study was to develop a model for initial estimation of health related losses and reduced performance in farmed Atlantic salmon in Norway, by making use of data available in official databases and from a company performing benchmarking within the fish farming industry.

Materials and methods

The benchmarking company MonAqua AS has since 1998 collected data on biological and economical variables from Norwegian salmon industry. For the year class 2002 MonAqua AS had data from 223 fish groups with a total of 45,3 mill smolts out of the national total of 139,6 mill smolts (Anonymous 2005a;Anonymous 2005c). Based on this data the effect of being at the 25'th percentile, the mean, and the 75'th percentile level of performance is estimated, all compared to the 90'th percentile of the fish groups, as the reference level, representing a potential we assume all producers could reach. Based on the same data the potential for improvement of the national production is estimated.

Calculated losses can be split in two categories based on the nature of the loss:

a) Losses which can be calculated by absolute reported figures including mortality, reported escaped fish, fish unfit for human consumption, lost production and downgrading.
b) Losses which have to be estimated based on the performance of the population including feed conversion rate (FCR) and growth.

The economic impact of the direct effect of disease and other types of losses, see table 1, is estimated by the following methods. First, type a) losses:

1. Loss of biomass is estimated by using the difference between biological and economical FCR, and converted to monetary values. Included figures for reported escaped fish (national figures) and fish unfit for human consumption are specified.
2. Downgrading is reported in percentage and monetary value is estimated by multiplying with volume and the reduction in monetary value.
3. Lost production is estimated by multiplying the number of lost fish with the difference between the average weight at slaughter and the average weight when the fish was lost. The monetary value is estimated by multiplying with average gross margins.

Secondly, type b) losses:

4. Increased feed conversion rate is estimated by using the 90'th percentile of the biological FCR as the potential for feed conversion – the reference. The difference between the lower percentiles and the reference is further converted to kg fish and then monetary value.
5. Reduced growth is estimated by using the 90 % percentile of growth factors as the potential for growth. The effect of reduced growth is converted to lost production and monetary value by multiplying with the average gross margins.

The conversion to monetary values in Euros, is made by using average exchange rates for 2004 and the average prize of € 2,09 per kg to fish farmers in 2004 (Anonymous 2005c). Downgrading gave a reduced prize of € 0,18 per kg for the category "ordinary" and € 0,78 per kg for category "production" (based on information from Norwegian producers).

Results

Table 1 Losses in € per licence using the 90'th percentile as the reference level.

Areas of loss	25% percentile	mean	75% percentile
1 Loss of biomass	188 000	102 000	16 000
(Escapees)		(2 000)	
(Unfit for human consumption)	(45 000)	(31 000)	(3 000)
2 Downgrading	38 000	31 000	7 000
3 Lost production*	0	0	0
4 Increased FCR**	232 000	161 000	65 000
5 Reduced growth*	0	0	0
Per average license	458 000	294 000	87 000
Per kg produced fish	0,68	0,43	0,13
National loss 2004		246 080 000	

* In the period up to 2005 feed quota was used to control farmed salmon production in Norway and was the limiting factor. Improved growth or less lost production would not increase production since feed was limited.
** FCR = Feed conversion rate

Discussion

The current calculations are making use of available, routinely collected data to estimate rough figures for losses in farmed Atlantic salmon in Norway. The results are preliminary and mark a start of a four year project aiming at improving the insight into the economic health related losses in Norwegian salmon farming. Currently the losses can not be split into specific conditions. Down the road the project aims to split the losses into different causes – disease or non-disease related. However, this preliminary study has revealed a lack of data quality as delivered from the industry such as 1) inaccurate numbers of fish, 2) use of incorrect weight of dead fish and 3) uncertainty about the weight of condemned fish which introduces errors and imprecision in the output from the presented calculations.

The loss of biomass consists mainly of mortalities, some condemned fish and relatively few escapees. Thus, a major part of the lost biomass will be health related. A recent pilot study (unpublished) showed that 82% of the mortalities first three months after sea transfer were due to

infectious diseases. Further 83% of 127 fish groups of the MonAqua AS 2002 yearclass reported health related causes such as deformities, vaccine side effects and ulcers as the main reasons for downgrading; sexual maturation was further reported by 17% of the groups (Anonymous 2005a).

Feed accounted for 56% of the production costs of Atlantic salmon farming in 2004 (Anonymous 2005b). Feeding regimes as well as feeding equipment are important factors for efficient feed utilisation. The presented calculations uses rough variables as FCR for comparison of feed utilisation and by using FCR, the variation in energy and protein content of feed is not taken into account. Diseases like infectious pancreatic necrosis (IPN) and pancreas disease (PD) will inevitably have direct effect on digestion, thus increasing FCR. Parasites like sea lice and tape worms will also increase FCR by feeding off the fish and within the fish, respectively. Common for all diseases is that metabolism and thereby feed conversion, to some degree, will be affected, however the effects of individual conditions are unknown.

The economical potential of a biological production is highly dependent on the limiting factors. Up to 2005 these were mainly the number of licences and the available feed quota per license. Improvement of growth or reduced lost production would not improve the annual throughput per license since no feed quotas would be available for utilising the potential. From 2005, however, production is controlled by maximum allowed biomass per licence (at any time). Thus, improved growth and increased survival will have great impact of the annual throughput per license, and not taking out this potential will become an important area of loss.

Conclusion

It is possible to establish useful models for estimating losses in Atlantic salmon production by use of data present in available production databases, but the overall estimate as well as the distinction between health related versus losses due to other causes, are very crude. The quality of the output from the model can be largely improved by better data input quality. The results also show that improving health and health management has substantial potential of improving the economy of the industry. Further work will be carried out to pinpoint how losses relate to different diseases and problem areas in salmon farming.

References

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